

## What is stroke?

A stroke (otherwise known as a "brain attack") occurs when brain cells die due to disruption of blood flow to the brain.

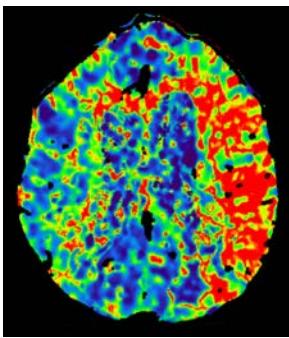
Stroke can be caused by either a blocked blood vessel ("ischemic stroke") or a leaky blood vessel ("hemorrhagic stroke") in the brain. Ischemic stroke is more common; hemorrhagic stroke is less frequent but can be more dangerous. Depending on the region of the brain affected, symptoms can include difficulty using or understanding language, slurring of speech, weakness or numbness of the arm, face, and/or leg (usually on one side), loss of vision or double vision, headache, and/or loss of consciousness. These symptoms usually occur suddenly without warning. However, about ¼ of patients do experience a warning called a transient ischemic attack (a TIA or a "mini-stroke"). A TIA does not leave permanent damage, but warns of an impending more serious stroke. *It is therefore important that TIAs are treated urgently to prevent future strokes.*

## Identifying the cause

Stroke treatment and prevention is based upon finding the reason for disrupted blood flow.

The most common first test is a CT scan to identify the type of stroke (ischemic or hemorrhagic), followed by a CT angiogram to look for areas of blockage or potential weakness in the blood vessels of the brain, and the blood vessels in the neck that lead to the brain. Blocked or weakened

arteries may require urgent treatment. Other tests such as an MRI, heart monitoring, echocardiogram (ultrasound of the heart) and special blood tests may be done to look for further causes of stroke and to determine what urgent and/or long-term treatments are best for patients.



## Comprehensive Stroke Center Faculty

### Cerebrovascular/Endovascular Neurosurgery



**Babak S. Jahromi, M.D., Ph.D.**  
Surgical Director, Comprehensive Stroke Center



**Amrendra S. Miranpuri, M.D.**  
Surgical Co Director, Neurocritical Care



**Neuro Critical Care**



**Manjunath Markandaya, M.D.**  
Medical Director, Neurocritical Care



**Catherine Nelson, M.D.**

### Vascular Neurology



**Curtis G. Benesch, M.D., M.P.H.**  
Medical Director, Comprehensive Stroke Center



**Todd M. Holmquist, M.D.**



**Adam G. Kelly, M.D.**



**Bogachan Sahin, M.D., Ph.D.**

## Comprehensive Stroke Care



 **UR MEDICINE** | **Neuromedicine**

## The region's only certified Comprehensive Stroke Center.

### Conditions:

- Acute ischemic stroke and TIA
- Intracranial and subarachnoid hemorrhage
- Brain aneurysms
- Arteriovenous malformations
- Carotid-cavernous and dural AV fistulas
- Carotid and vertebral artery stenosis
- Intracranial stenosis, Moya-Moya disease
- Spinal vascular malformations
- Vascular tumors

### Treatments:

- Intravenous tPA for acute stroke
- Comprehensive secondary stroke prevention
- Endovascular embolization for brain aneurysms
- Craniotomy for aneurysm clipping
- Embolization / craniotomy / radiosurgery for AVM
- Endarterectomy / stenting for carotid stenosis
- Intracranial angioplasty and bypass surgery



Our dedicated team has successfully treated the most challenging diseases, and achieved the best outcomes in the most critically ill patients, while providing continuing outpatient preventative stroke care. Our center provides a comprehensive multidisciplinary team comprised of fellowship-trained vascular neurologists, neurosurgeons, neuroradiologists and neurocritical care specialists.

Our facilities include the most advanced MRI and CT capabilities, the only dedicated neurointensive care unit, and the only hybrid intraoperative/endovascular biplane angi-suite in the region. By combining expert care and sophisticated technology, we give our patients the best chance of recovering from stroke and avoiding future strokes.

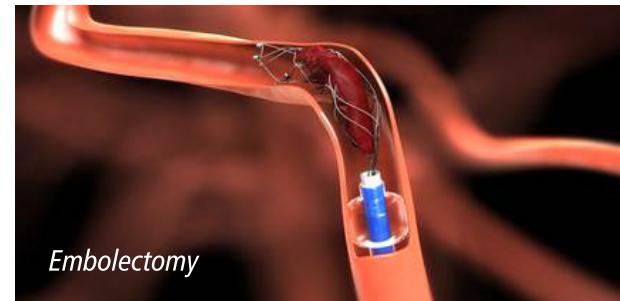


The region's only Neuromedicine ICU

## Surgical Treatments

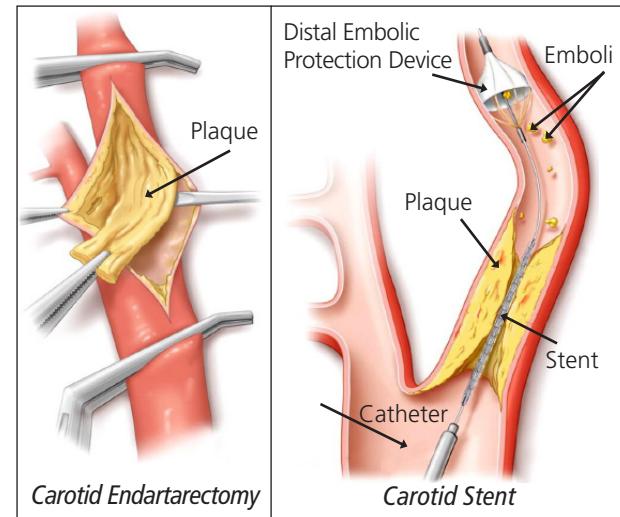
*Some patients aren't candidates for "clot-busting" drugs and need emergency surgery to treat blocked or bleeding brain blood vessels.*

Initial tests (such as a CT angiogram) may show a clot inside an artery, blocking blood flow to the brain ("ischemic stroke"). Our neurosurgeons are fellowship-trained to use special catheters and devices to emergently open these brain arteries. This can restore blood flow to the brain and reverse the cause of stroke, thereby giving patients the best chance of recovery.



Embolectomy

Following recovery from stroke, our cerebrovascular neurosurgeons can perform surgery or stenting to open a narrowed artery that caused the initial stroke, thus helping prevent future events.



Carotid Endarterectomy

Distal Embolic Protection Device

Plaque

Carotid Stent

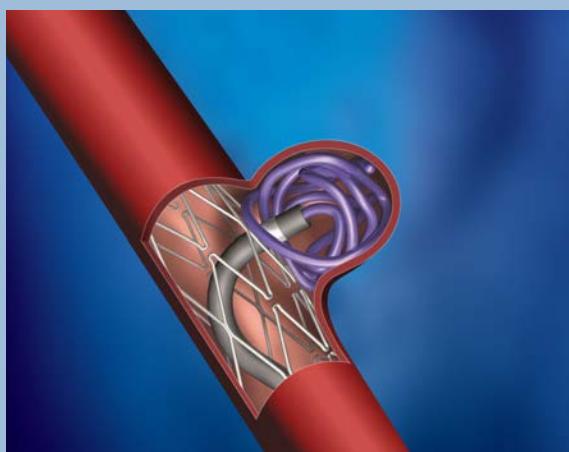
Stent

Catheter

Patients with stroke caused by leaking blood vessels (such as burst brain aneurysms or AVM) may require embolization (using wires and catheters inside the arteries) and/or craniotomy (open brain surgery). Our neurosurgeons have extensive subspecialty training in these life-saving surgeries, and perform the largest number of these procedures in the region.



Aneurysm Clip



Aneurysm Stent/Coil

## Recovery & Rehabilitation

*Our multidisciplinary stroke team will help manage all aspects of your recovery.*

While some patients recover within days, it is not unusual for recovery to take weeks to months. To help stroke patients recover to their maximum potential, each patient is evaluated for their physical, occupational, and speech therapy needs, along with intensive rehabilitation. Ongoing follow-up visits with our stroke specialists help insure the best medical and preventative care is in place to minimize chances of a future stroke.



UR Medicine Comprehensive Stroke Center

Curtis G. Benesch, M.D.  
Medical Director

Babak S. Jahromi, M.D., Ph.D.  
Surgical Director

## Medical Treatment

*Within the first 3-4.5 hours of having a stroke, an intravenous "clot-busting" drug can be given to open blocked arteries.*

Stroke patients are rapidly assessed in the emergency department by a specialized stroke team including vascular neurologists, neurosurgeons, and emergency physicians. In patients with an "ischemic stroke" (i.e. no blood is seen on their initial CT scan) who arrive in time, a "clot-busting" medication called tPA can be used to help open blocked arteries. This greatly improves the chances of recovery and independence after stroke. In patients with hemorrhagic stroke ("bleeding in the brain"), control of blood clotting factors, blood pressure, and even emergent surgery may be required.

After initial treatment, patients are either admitted to a dedicated stroke unit, or may first require critical care in our neurointensive care unit. Supportive medical treatments and stroke prevention therapies are then instituted by our neurocritical care specialists and vascular neurologists who specialize in treatment of stroke. Based upon results of the tests above, our team will design the right combination of medication, therapy, and in some cases preventative surgery, to avoid future strokes. Identifying risk factors and how to best control them will minimize the risk of stroke recurrence.